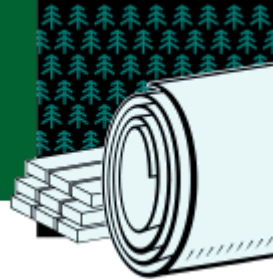


# FOREST PRODUCTS

## Project Fact Sheet



### EVALUATION AND DEVELOPMENT OF A PROTOTYPE ELECTROKINETIC SONIC AMPLITUDE (ESA) SYSTEM FOR ON-LINE MEASUREMENT OF ZETA POTENTIAL IN PAPERMAKING PROCESS STREAMS

#### BENEFITS

- Provides continuous control over wet end chemistry
- Saves cost in papermaking additives
- Decreases build-up of colloidal material in the white water
- Increases water savings
- Improves potential for recyclability
- Reduces machine downtime due to loss of drainage control
- Allows greater substitution of cheaper paper fillers for more expensive pulp fibers
- Increases machine speeds and energy savings from lower steam requirements

#### An ESA System to Control the Wet End Paper-Making Process Through Zeta Measurement

Zeta potential, a measure of fiber voltage, determines the retention of fines, fillers, and the adsorption of polymers. Since zeta has a significant ability to alter sheet formation, its accurate measurement has the potential to control wet end chemistry in the papermaking process. Commercial attempts to gauge zeta potential are difficult and often inconsistent or restricted.

A method of measuring zeta potential of colloidal suspensions and spherical particles in the integrated circuit industry, electrokinetic sonic amplitude (ESA), is a prospective application in papermaking streams. This ESA technology provides downstream rate of reaction measurements in continuous real-time from a simple flow-through sensor. Researchers will work under the assumption that zeta potential of filler particles is equivalent to that of wood particles. Work will result in a simple and robust process control tool to measure zeta potential, significantly improving wet end chemistry and sheet formation.

#### APPLICATIONS

Possible application points include coated broke pulpers, coated broke chests, recycled fiber chests, and virgin hardwood or softwood low density stock chests. This measurement potential also provides a means to track the adsorption of a polymer additive by fibers and fines or as a trouble-shooting device.



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## PROJECT DESCRIPTION

**Goal:** To demonstrate a functional prototype of an ESA system for on-line measurement of zeta potential in papermaking process streams

During its first year, this project will focus on collecting preliminary data to determine the best technique for measuring the zeta potential of wood fibers. This three phase program will be conducted over a period of three years:

### Phase 1:

- Determine technique for measurement of zeta potential using preliminary tests
- Establish relationships for calcium carbonate and fiber and filler particles
- Develop lab prototype ESA system

### Phase 2:

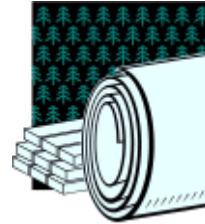
- Validate lab prototype ESA system
- Integrate prototype into continuous measurement loop
- Conduct empirical studies on screened fibers, pulp, and furnishes
- Estimate system performance with established algorithms

### Phase 3:

- Perform process control studies using flow loop
- Develop field prototype
- Demonstrate field prototype at selected mill site
- Commercialize technology

## PROGRESS & MILESTONES

- A literature analysis was conducted.
- Instruments for use in the experiments were donated.
- The Institute for Paper Science and Technology (IPST) shipped samples of modified Rayon fibers to Pacific Northwest National Laboratory (PNNL) to test if modified fibers can be shipped and stored under dry conditions. Results indicated that the zeta potentials for both modified and unmodified fibers are the same as that of before drying.
- PNNL observed that rayon or wood fibers do not give a strong ESA signal to achieve a reliable signal and therefore result in a reliable zeta potential value. However, researchers re-examining whether there may be promise that fibers do give enough ESA signal for the AcoustoSizer to perform a reliable measurement.
- The Muetek instrument measured the streaming potential of various concentrations of rayon, hardwood, and softwood fibers as well as wood fibers/filler suspensions.
- The AcoustoSizer instrument measured the zeta potential and ESA signals of the fibers, fillers, and mixtures thereof.



### PROJECT PARTNERS

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